

## THE LIMIT OF COLD

Absolute Zero and the Way It is Defined by Science.

## POINT OF MOLECULAR DEATH

At 459.4 Degrees Below the Fahrenheit and 273 Degrees Below the Centigrade Zero There is No Heat, No Energy and No Motion Within Matter.

Few people have any definite idea of the meaning of absolute zero. When temperatures or degrees of heat are mentioned it is natural for most people to think of these degrees as given on the household or Fahrenheit scale, with its freezing point at 32 degrees and its boiling point at 212. The space on the Fahrenheit thermometer below the freezing point of water is divided into thirty-two equal spaces down to zero. The other thermometer scale in common use is the centigrade scale, with its boiling point at 100 degrees and its freezing point at zero. The zero points on these two scales are not the zero of absolute temperature or absolute zero, but are only two relative points.

Temperature as used and spoken of in ordinary practice is only relative and is measured in reference to two points—the boiling and freezing points of water at sea level. But science and scientific investigation requires another scale for its measurements, which has a theoretically correct zero point. This scale is called the absolute scale, with its zero point 273 degrees below the zero of the centigrade scale and 459.4 degrees below that of the Fahrenheit zero. This is what is meant by the zero of absolute temperature.

Absolute temperature has been defined. According to science, all matter is composed of small particles or molecules in ceaseless vibration in the spaces between them. This molecular motion, as it is called, is much greater in gases than it is in liquids or solids, and the ultimate particles are farther apart. The idea of absolute zero, and the place assigned to it on the absolute scale is based on this property of matter—motion. In gaseous forms of matter the motion is greater because of the greater space between the particles.

To illustrate the meaning of this point and to explain how it was got, imagine a volume of air of 273 cubic inches at the temperature of freezing water on the centigrade scale. Heat this volume of air to 1 degree centigrade and its volume will have increased to 274 cubic inches, and if heated to 2 degrees its volume will be 275 cubic inches. Likewise, if the original volume be cooled 1 degree below the freezing point of water its volume will be decreased by one cubic inch and become 272 cubic inches. For every additional decrease of 1 degree the volume will contract one two-hundred and seventy-third part of what it was to begin with, so that, if the cooling is carried far enough, it is easy to see that at 273 degrees below the freezing point of water the volume will become nothing.

The volume of a gas is due to the real volume of its individual particles, together with the volume of the spaces between these particles. At ordinary temperatures these particles are in swift motion. But for every degree of cooling this motion is slackened, and the paths of vibration become shorter. This motion continues down to 273 degrees below the centigrade zero, where the motion has entirely ceased and the paths of the particles are infinitely short. Of course the gas under consideration at -273 degrees will have a volume due to the sum of the volume occupied by the molecular particles themselves.

This 273 degrees then is the absolute zero. It is the point of molecular death. No heat is there, no energy and consequently no motion. Matter at this point is entirely motionless within itself.

The thermometer scales of the world should be based on it as the logical starting point. The freezing point of water, which is zero on the centigrade scale, referred to the absolute scale is -273 degrees, while the freezing point of 32 on the Fahrenheit scale is -459.4 degrees on it. The ordinary temperature of a room is about 68 degrees F., or 527.4 degrees on the absolute scale. On the same scale summer heat is about 558 degrees F.

The zero of absolute temperature has nearly been reached in the preparation of solid hydrogen gas and liquid helium. The temperature of liquid helium (one of the rarest of gases) is only about 4 degrees above absolute zero, so that the individual particles of liquid helium have almost become motionless. Probably in the near neighborhood of absolute zero this gas, which is the only one that has not been solidified, will become solid and represent matter in its state of molecular death.—W. G. Dumas in Chicago Record-Herald.

The Longest Novel.  
The "Story of the Eight Dogs" is the longest novel that has ever been published. Fortunately, perhaps, it is written in Japanese, so no one will set himself the task of reading it. It contains 106 volumes, several hundred characters and numerous dogs, all of which are successfully disposed of by the time the last chapter is reached. Just imagine reading through that one book that would last a lifetime!

The world's great men have not commonly been great scholars nor its great scholars great men.—Holmes.

## STORIES OF O. HENRY.

A Promised Visit and the Droll Way It Was Evaded.

Wherever one goes one hears a story of the late O. Henry, the writer. Every one in magazine circles hereabouts knew him, and most had had a personal experience or two. Somehow every story illuminates the man. They are not merely humorous tales, but through them one catches a glimpse of his characteristics, his broad humanity or his generosity or his love of the city. Robert H. Davis, the magazine man, related that on one occasion he went a-visiting with O. Henry down on Long Island.

"It was a very hot day," said Davis. "We had climbed an everlasting hill. Another greater hill stretched before us. The sun was a disk of brass, and dust and heat and clicking insects rose from the ground. We sat on a fence to rest."

"Is there anything else I can show you?" I asked him.

"Yes," said Henry, wiping his forehead. "Show me a return ticket to New York."

"On one occasion he had promised to spend the week end with Gilman Hall at his country place in Jersey. Mr. Hall had invited him several times. When Henry finally accepted Hall gave him the most precise directions.

"Take a 3 o'clock train on Friday afternoon," said Mr. Hall, "and I will meet you with the carryall at the station."

"At 11 o'clock on Friday morning Mr. Hall was called to the telephone in his country home. The boy at the railroad station droningly informed him that there was a telegram for him, signed 'O. Henry.'"

"Read it," commanded Mr. Hall, and the boy's sleepy voice buzzed over the wire.

"New York," he read, "Twenty-third street station, Western Union Telegraph company, 10:30 a. m. Addressed, Gilman Hall, Far Out, N. J. Dear Hall—I have missed the 3 o'clock train. Signed, O. Henry."

"Neither Henry nor Hall ever referred to the telegram or the evaded visit in subsequent talks."—New York Letter to Cincinnati Times-Star.

First Mail Coach in 1784.  
A theater owner was responsible for the first mail coach in 1784. John Palmer, Bath, England, saw that it took four days to get his actors from London. He went to the government authorities and persuaded them to start a number of coaches to carry the mails and that these coaches should be built for speed and drawn by the fastest animals in England. In a little while a revolution was worked.

A Gossipy Mother.

"A gossiping woman makes me mad," declared small Donald.

"What's a gossiping woman?" asked his younger brother.

"One who tells everything she knows," explained Donald. "Mamma is one. Every time we misbehave she runs and tells papa."—Chicago News.

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Gave Him a Warm Tip.

"Yes, it's a lot of trouble to raise hens, till you know how," said a poultry dealer. "I'll tell you a story about that very point. A man who looked as if he hadn't had anything to eat for a week or so leaned over the back fence of my park some time ago. I had my eye on him, and he saw I had my eye on him, so he started up a conversation.

"Must be a lot of expense to keep up such a lot of fowls," he said.

"Not such a much," says I.

"What's the principal item?" he wants to know.

"Powder an' shot," I tells him.

"An', do you know, he never come back to ask no more questions? Dips-may is a good thing to raise hens with too."—Cleveland Plain Dealer.

## JOHN SCOTT'S PUP

He Is an Affectionate Critter and Dearly Loves His Master

YET HE GOT HIM IN TROUBLE

The Joyous Antics of the Playful Canine Brought About the Scene That Quivered John With His Wife and Gave Color to Her Cruel Suspicion.

One of the most touching things in nature is the affection of a dog for its master. Authors have wept over this before now. Indeed, in some cases canine affection would make a cube of billiard chalk wisp.

John Scott has an affectionate dog. It is a young dog, but joyful, and he keeps it in the cellar at night. The dog and the furnace are great friends, probably because contrasted natures agree well. The dog's nature is warm, and the furnace's nature is cold. But the pup simply adores John Scott.

One night John Scott left the banquet of the Petonic club at 1 o'clock in the morning when his wife had told him positively to be home at 10:30. She had told him also to drink but one cocktail. That was the only cocktail he drank, but in the bright lexicon of banquets there are other drinks. The cure free yet dignified manner in which John Scott wended his homeward way gave proof that he had studied the lexicon.

He was not intoxicated. He could still lift his feet as he walked, but when he had lifted a foot he waved it in the air a moment before he decided just where to set it down, and it did not always hit the exact spot he had selected. But his brain was clear as a bell. He remembered that he must put coal in the furnace before he went to bed.

When he opened the cellar door the pup was asleep on his bed in a box, but by the time John Scott had descended the cellar stairs the pup and its affectionate nature were wide awake. The pup gave one little bark of joy and rushed across the cellar like a rubber shoe fired out of a cannon and stopped itself by making a flying tackle with its teeth on the hem of one of the legs of John Scott's dress trousers. John Scott awayed, put out a hand and sat down on the floor, and the pup affectionately climbed into his lap and, putting two coal dusty paws on John Scott's shirt bosom, kissed him.

This evidence of canine affection was too much for John Scott. He compared it with the reception he would probably receive from Mrs. Scott, and he was so affected that he hugged the pup to his bosom and wept. Then he placed the pup carefully on the cellar floor and stood up. The pup immediately got between his feet, threw him twice as he walked to the coal bin and, when he bent down to pick up the coal scoop, grabbed the tail of his dress coat in a death grip.

Mr. Scott divested himself of the pup by taking off his coat and hanging it on a nail—the one the poker hangs on. All indications pointed to a permanent suspension of the pup. The pup hung to the coattail, and the coat hung on the nail, and Mr. Scott turned to the coal bin. He raised the scoop ready to plunge it into the coal, but as he did so he paused. The pup was standing on the coal, just where the scoop was about to scoop up coal. At intervals the pup would dash down and worry the heel of Mr. Scott's dress trousers, but whenever the scoop approached the coal the pup got in front of it. Sometimes Mr. Scott scooped up the pup, and sometimes he missed the pup, the coal and the bin, but whenever he got coal he got the pup too. If by chance he got coal in the scoop without any pup the pup showed its canine affection by jumping into the scoop. Then the coal and pup would slide off the scoop on to the floor.

Not for worlds would John Scott have shoveled the affectionate pup into the furnace, but he saw that he was likely to do so any minute if he continued to fool with the scoop. There was but one way to get the coal into the furnace without creating the pup. So John Scott proceeded to that way. He sat on the coal and held the pup in his lap and threw coal piece by piece at the furnace door.

And this was the only basis for Mrs. John Scott's unjust suspicion that John Scott had taken more than one cocktail at the Petonic club banquet. She came to the head of the cellar stairs to see what was bombarding the tin sides of the furnace, and she saw John Scott sitting on the coal in his shirt sleeves weeping over the affection of the pup and throwing coal at the furnace with his left hand, while the pup nestled inside his dress waistcoat and kissed his face. And she accused him of having taken more than one cocktail!

But a woman never knows how the affection of a canine affects a tender hearted Petonic club banqueter. The love of a dog for its master will touch the heart of the strongest man.—Ellis Parker Butler in Judge's Library.

Only Goldbugs.

A well known Fourth avenue banker was sitting in a downtown restaurant eating mush and milk.

"What's the matter?" inquired a friend.

"Got dyspepsia."

"Don't you enjoy your meals?"

"Enjoy my meals?" snorted the banker dyspeptic. "My meals are merely goldbugs to take medicine to force on after."—Pittsburgh Post.

Doubt of all kinds can be removed by nothing but action.—Goethe.

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